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There is moderate evidence indicating vestibular rehabilitation therapy is effective in treating vestibular disorders

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CLINICAL SCENARIO:

Individuals with vestibular disorders are not only limited in daily occupations, they are at higher risk for falls, social isolation, and depression due to giving up valued occupations. Individuals report that they frequently try to avoid moving their heads to evade vertigo/dizziness, and when they must move, they do so more slowly than is normal. Occupational therapists often treat patients who have vestibular disorders that interfere with both daily occupations and even participation in therapy designed to alleviate symptoms. For this reason, it is important that therapists be aware of the most effective vestibular rehabilitation approaches.

FOCUSED CLINICAL QUESTION:

Is vestibular rehabilitation effective in treating vestibular disorders in older adults?

SUMMARY of Search, 'Best' Evidence' appraised, and Key Findings:

Evidence from five studies specific to older adults was located and appraised. The studies present evidence that suggest older adults with vestibular disorders improve with:

- A detailed home exercise program
- A weekly reminder to complete the exercises
- Four weeks of treatment to decrease vertigo

The evidence also suggests that older adults demonstrate the following after vestibular rehabilitation:

- Overall improved Dizziness Handicap Inventory score
- Significant improvement in the Gaze Stabilization Test
- Improved ability to stand on one foot with eyes closed
- Improved dynamic visual acuity
- Improved quality of life by reducing the handicap index
- Improved ability to do everyday tasks

CLINICAL BOTTOM LINE:

Vertigo decreased and speed of head movement improved after a four week program of vestibular rehabilitation, regardless of speed of treatment exercises. Purposeful activities/occupations requiring head movements can be useful in evaluating improvements after vestibular rehabilitation.

Limitation of this CAT: This critically appraised paper has not been peer-reviewed by one other independent person/a lecturer. Preparer of this document is an occupational therapy student and a novice practitioner. Furthermore, this was not an exhaustive search of the literature.

SEARCH STRATEGY: The search was conducted from September 2009 thru October 2009

Terms used to guide Search Strategy:

- **P**atient/Client Group: Well-elderly, older adults, aged
- **I**ntervention (or Assessment): Vestibular rehabilitation, occupational therapy
- **C**omparison: Nil terms used
- **O**utcome(s): Reduction in vertigo and dizziness

Databases and sites searched	Search Terms	Limits used
Medline Ovid CINAHL PsychINFO Ovid Evidence Based Medicine Reviews Multifile Cochrane	Occupational therapy Vestibular rehabilitation Vestibular rehab Aged Elderly Older adults Dizziness Vertigo Therapeutics Eye gaze exercises Balance	Limit older adult to age 50 or older Evidence based studies Peer reviewed

INCLUSION and EXCLUSION CRITERIA

- Inclusion: Any study design examining the effectiveness of vestibular rehabilitation on decreasing dizziness and vertigo in people over age 50, written in English, and peer-reviewed articles only.
- Exclusion: Non-peer reviewed sources, non-English language sources, studies that examined other conditions or had vertigo as a secondary condition, or studies that used a treatment other than vestibular rehabilitation.

RESULTS OF SEARCH

Articles describing any intervention using vestibular rehabilitation procedures in older adults were utilized (See Table 1). One clinical practice guideline specifically for occupational therapy intervention was found but was not included since it was of expert opinion only.

Table 1: Summary of Study Designs of Articles retrieved

Study Design/ Methodology of Articles Retrieved	Level	Number Located	Author (Year)
Randomized Control Trial	Level 1	3	• Cohen & Alford, (2004) • Hansson, Mansson, & Hakansson, (2004) • Bittar & Venosa, (2007)
Before and after	Level IV	1	• Badaracco, Lanin, Meli, Angelis, & Tufarelli, (2007)
Cohort	Level II	1	• Schubert, Migliaccio, Clendaniel, Allak, & Carey, (2008)
Clinical Guidelines	N/A	1	• OT Practice (2008)

BEST EVIDENCE

The following study/paper was identified as the 'best' evidence and selected for critical appraisal. Reasons for selecting this study include the following:

- Randomized Controlled Trial
- Level I evidence
- Moderate sample size
- Study included clinical implications
- Detailed description of home exercise program
- Intervention described in the study could be replicated in the clinic
- The use of activities/occupations incorporated into the intervention
- Intervention was appropriate for the population
- The study was conducted within the last two years
- Addressed the issue of a client's perceptions about his/her vestibular impairment

SUMMARY OF BEST EVIDENCE

Table 2: Description and appraisal of randomized control study by Cohen & Alford, (2004)

Aim/Objective of the Study/Systematic Review:
The objective of the study was to determine if performance on a purposeful activity improves after vestibular rehabilitation exercises, and if the speed of treatment influences performance.

Study Design:
- Randomized control trial- subjects were randomly assigned to one of two treatment groups as they entered the study. Prior to the start of the study, a randomization spreadsheet was made up, using random numbers. As each subject entered the study, the subject was assigned to the next group listed on the spreadsheet.
- No blinding
- Outcomes were measured before and after intervention

Setting:
Medical school practice/tertiary care facility

Participants:
The sample consisted of 53 patients, 38 females and 15 males. The mean age was 51.1 years. They had all been referred to the senior author for vestibular rehabilitation due to chronic, uncompensated vertigo for at least 2 months. No subject could have concurrent or previous otologic, neurologic, or orthopedic disease. No subjects had Meniere's disease, actue labyarinthitis, acute vestibular neuronitis, or benign paroxysmal positional vertigo. Subjects were randomly assigned to one of two treatment groups as they entered the study. Originally, 71 subjects had been recruited but 18 subjects dropped out because of illness unrelated to the vestibular impairment, failure to comply with exercise program, or failure to return for post-testing.

Intervention Investigated
Pre and post-tests were conducted prior to the intervention using the Vestibular Disorders Activities of Daily Living Scale (VADL). After completing this, the subjects sit in a standard chair with a basket of beanbags in front of him or her. The examiner stands 1 m in front of the chair holding an empty basked 100 cm above the floor. Moving as fast as possible, the subject moves the beanbags one at a time to the examiner's basket while the examiner times the task with a stop watch. The subject then rates the intensity of vertigo elicited by the task using the 10-point scale.

The intervention was delivered in a medical school practice/tertiary care facility by an unspecified person. Each subject was given a written home program of repetitive head movement exercises. Subjects were instructed to do their exercises five times per day: before breakfast, before lunch, mid-afternoon, before dinner, and before going to bed. Group 1 was instructed to move their heads rapidly while Group 2 was instructed to use slower repetitive head movements. Group 1 was divided into two subgroups to determine if extra attention from a weekly reminder telephone call influenced the outcome. Group 1B received a weekly telephone call from a staff member whom reminded them to do the exercises.

Experimental/Control:
This study did not contain a true control group. Both groups received treatment. One group received instruction to perform the head exercises rapidly while the other group performed them slowly.

Outcome Measures
The main measures where the time to perform a repetitive head movement task and intensity of vertigo elicited by that task, questionnaires about independence in ADL, and reported usual intensity of vertigo. Vestibular Disorders Activities of Daily Living Scale (VADL) is a 10-point scale that is sensitive to the subtle functional deficits experienced by patients with vestibular impairments. Ratings of vertigo intensity used a 10-point scale: 1 none, 2-3 slight, 4-5 mild, 6-7 moderate, 8-9 severe, and 10 extreme

vertigo. Subjects were verbally read the description for each level of the scale while viewing a 12.5X17.5 cm card with the scale printed in 36 pt type.

Main Findings:
Both groups significantly decreased the time to perform the task and the intensity of elicited vertigo. Results were related to improved independence in ADL and to decreased vertigo. Multilevel models were used to describe changes in the outcome variables (time to perform the task and elicited vertigo intensity) over time and to assess the effects of other explanatory variables that might have influenced the outcome variable.

Time to perform the test decreases very slowly and steadily during the six month follow-up and changes were very highly significant, p=0.00002. Changes in this measure were not different among the treatment groups. Neither age, gender nor level of vertigo of the subjects influenced their performance times. Changes in performance time were weakly associated with median VADL score (p=.0271). As the VADL score improved over time within subjects, time to perform the repetitive head movement task decreased over time within subjects. Groups one A and one B (the groups that did or did not receive a reminder phone call to do the exercises) did not differ significantly.
Intensity of vertigo elicited by the task decreased markedly at the one-month posttest, followed by a gradual decline during the remainder of follow-up and this change was very highly significant.

Original Authors' Conclusions
The authors concluded that the study showed that vertigo decreased and speed of heat movement improved after a program of vestibular rehabilitation, regardless of speed of treatment. They also stated that a simple purposeful activity can be useful to evaluate improvements after vestibular rehabilitation. They also found that there is an association between scores on this test with VADL scores, which supports previous findings that improved independence in activities of daily living is associated with participating in vestibular rehabilitation.

Critical Appraisal:
Validity
Strengths of this review include:

- The RCT study design is level I evidence
- Data was presented clearly in tables and charts
- Detailed intervention described
- Inclusion/exclusion criteria were used to screen subjects
- Informed consent required from subjects
- Subjects were randomly allocated to one of two treatment groups
- Valid and reliable instrument used (VADL)
- PEDro Scale: Internal Validity: 3/8 Statistical Reporting Score: 2 Total Score: 5/10 **Comments: Internal Validity:** sample was randomly allocated, allocation was not concealed, baseline comparability established, subjects and assessors not blinded to intervention, drop-outs reported as less than 85%, non-compliers identified, intention to treat analysis not addressed. **Statistical Reporting:** clear description of methods of analysis, results reported as statistically significant, conclusions were related to study results.

Selection and Data biases:

Although this study had many points of validity, there were some weaknesses noted by this student. The study fails to explain in detail how the follow-up was performed, which suggests a methodological flaw. Secondly, the sample size was not very large (53 subjects) so it may be questionable if the sample represents the true population and whether or not results can be generalized to a larger population. The study did not include a true control group because both groups received treatment. Both groups received some type of intervention and the authors of the study state that this was a limitation. Because subjects were not blinded during the study this could be a source of bias. Likewise, the assessors were not

blinded which may contribute to measurement detection bias. A majority of the vestibular rehabilitation studies analysed by this student used different outcome measures. Other outcomes measures used were the Rhomberg, dizziness handicap inventory, gaze stabilization test, Fukuda test, and computerized DVA test. No one study used the same outcome measures.

Interpretation of Results

Evidence from this randomized controlled trial suggests that performance of vestibular rehabilitation exercises is not affected by speed of head movements. The study reports that exercises performed slowly are as effective as exercises performed rapidly. P-values demonstrate statistically significant results. Both groups significantly decreased the time to perform the task and the intensity of elicited vertigo. Results were related to improved independence in ADL and to decreased vertigo. Multilevel models were used to describe changes in the outcome variables (time to perform the task and elicited vertigo intensity) over time and to assess the effects of other explanatory variables that might have influenced the outcome variable. The effect size was not included in the results of this study. This occupational therapy student calculated the effect size and found it to be 2.51, indicating a large effect size, which shows this study to be powerful.

Summary/Conclusion:

The evidence can be cautiously inferred from this randomized controlled trial in older adults is that:

- Vestibular rehabilitation head movement exercises decrease vertigo and dizziness.
- It remains debateable how long patients remain symptom free post-intervention.
- Patients perform repetitive head movement tasks more quickly and have reduced vertigo intensity after performing exercises.
- Since vestibular impairment is so disabling and none of the studies show harm, one might consider the benefits to outweigh the relatively low cost to implement this treatment as worthwhile.
- Vestibular rehabilitation can improve quality of life by allowing an older adult to do that which he/she needs, wants, and has to do.

Table x: Characteristics of included studies

	Study 1 Badaracco, C., Labini, F.S., Meli, A., Angelis, E.D., & Tufarelli, D. (2007)	Study 2 Bittar, R.S., & Venosa, A.R. (2007).	Study 3 Hansson, E.E., Mansson, N.O., & Hakansson, A. (2004)	Study 4 Schubert, M.C., Migliaccio, A.A., Clendaniel, R.A., Allak, A., & Carey, J.P. (2008)
Intervention investigated	The performance of one cycle of 12 daily rehabilitation sessions (2 hours each) consisting of exercises to improve vestibulo-oculomotor reflex	Performance of exercises for adaptation of the vestibulo-oculomotor reflex	Balance training on uneven surfaces (such as foam) and vestibular rehabilitation in group sessions twice a week for six weeks	Gaze and gait stabilization, consisting exercises performed 4 to 5 times per day for a total of 20 to 30 minutes
Comparison intervention	None	Control group performed placebo exercises	None	Passive head thrusts rather than active head movements
Outcomes used	Dizziness Handicap Inventory, Activities Specific	Rhomberg test Fukuda test, PHSN test,	Rhomberg test, Stops walking when talking test,	Dizziness Handicap Inventory (valid

	Balance Confidence Scale, Computerized Dynamic Posturography, Computerized Dynamic Visual Acutity Test, and Gaze Stabilization Test	Visual analogue scale (valid and reliable), Fukuda test, and PHSN test	SOLEO/SOLEC(standing on one leg with eyes open/closed), Walking heel to toe, Walking in a figure eight, Visual Analogue Scale	and reliable), Computerized DVA test, and Single opotype (letter E)
Findings	Patients significantly improved in all tests	Vestibular exercises are effective in reducing the duration of symptoms and the need of medication	Balance training and vestibular rehabilitation improved the ability to stand on one leg with eyes closed in persons with dizziness aged 50 years and over	Vestibular rehabilitation increases angular vestibule-ocular reflex during active head rotation

IMPLICATIONS FOR PRACTICE, EDUCATION and FUTURE RESEARCH

Implications for Practice:
The clinical messages of the study include the following:

- After four weeks of vestibular rehabilitation, patients have decreased vertigo and faster performance on the repetitive head movement test.
- The speed of head movements need only to be fast enough to elicit visual/vestibular interaction.
- A goal-directed task can be useful as part of an evaluation test.

In regards to occupational therapy, vestibular rehabilitation can incorporate meaningful activities in order to evaluate the effects of the rehabilitation. By decreasing vertigo and dizziness, clients will be able to participate more fully in daily occupations. The intervention introduced by this study is also one that could be performed by occupational therapists since it could be used in conjunction with occupation and does not require specialized equipment or additional training.

The findings from each study retrieved present data that shows moderate evidence that vestibular rehabilitation is effective in decreasing vertigo and dizziness. Each study reviewed by this student showed that vestibular rehabilitation decreased vertigo and dizziness by impacting various areas. A study by Schubert, M.C., Migliaccio, A.A., Clendaniel, R.A., Allak, A., & Carey, J.P. (2008) found that dynamic visual acuity (DVA) improved, which is important since DVA enables one to see an image while one's head is moving. A study by Badaracco, C., Labini, F.S., Meli, A., Angelis, E.D., & Tufarelli, D. (2007) found that quality of life improved as indicated by reducing the handicap inventory. This is particularly important for occupational therapy clients because as handicap decreases, the ability to perform occupations increases. A study by Bittar, R.S., & Venosa, A.R. (2007) discovered that vestibular rehabilitation exercises are effective in reducing the duration of symptoms and the need for medications. These findings are particularly important for those individuals who wish not to take medications, for whatever reason.

Education:

Occupational therapy students should be taught about effective interventions for patients with vestibular disorders. Students would also benefit from being exposed to outcome measures related to vestibular disorders so that they can utilize them when in practice.

Future Research:

- Future research should be done specifically in regards to occupational therapy and the use of vestibular rehabilitation exercises.
- No CATS were located from otcats.com, possibly indicating that more research from occupational therapists should be conducted.
- More research should be done from a patient's self-perception of vertigo/dizziness and its effect on independence/occupational performance.
- Further research could also be done to determine if vestibular rehabilitation is effective in other populations, such as young adults.
- Further research should be conducted to determine how long the benefits of vestibular rehabilitation last after treatment.
- The current occupational therapy standard of care for vestibular disorders begins with the evaluation, which consists of a visual assessment, addressing psychosocial issues, and other considerations, such as manual muscle testing, pain, and sensory testing. Intervention includes adaptation, substitution, and habituation. It would behove occupational therapists to research effective rehabilitation exercises that could be incorporated into therapy, especially if incorporated as meaningful activities/occupations.

REFERENCES

Critically appraised paper presented in this document as 'best evidence':

Cohen, H.S., & Alford, B.R. (2004). Changes in a repetitive head movement task after vestibular rehabilitation. *Clinical Rehabilitation, 18,* 125-131.

Related critically appraised papers:

Badaracco, C., Labini, F.S., Meli, A., Angelis, E.D., & Tufarelli, D. (2007). Vestibular rehabilitation outcomes in chronic vertiginous patients through computerized dynamic visual acuity and gaze stabilization. *Otology & Neurotology, 28,* 809-813.

Bittar, R.S., & Venosa, A.R. (2007). Vestibular rehabilitation exercises in acute vertigo. *The Laryngoscope, 117,* 1782-1487.

Hansson, E.E., Mansson, N.O., & Hakansson, A. (2004). Effects of specific rehabilitation for dizziness among patient in primary healthcare. A randomized controlled trial. *Clinical Rehabilitation, 18,* 558-565.

Schubert, M.C., Migliaccio, A.A., Clendaniel, R.A., Allak, A., & Carey, J.P. (2008). Mechanism of dynamic visual acuity recovery with vestibular rehabilitation. *Archives of Physical Medicine Rehabilitation, 89,* 500-507.